

THE GENERAL SUBJECT

OF

QUARANTINE,

WITH PARTICULAR REFERENCE TO

CHOLERA AND YELLOW FEVER.

BY

JOHN M. WOODWORTH, M.D.,

SURGEON-GENERAL, MERCANTILE MARINE-HOSPITAL SERVICE, UNITED STATES OF AMERICA.



EXTRACTED FROM THE TRANSACTIONS OF THE
INTERNATIONAL MEDICAL CONGRESS,
PHILADELPHIA, SEPTEMBER, 1876.

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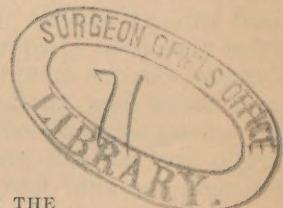
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GENERAL SUBJECT OF QUARANTINE, WITH PARTICULAR REFERENCE TO CHOLERA AND YELLOW FEVER.

THE earliest recorded measures instituted to prevent the spread of disease were adopted by Moses, who made regulations concerning the leprosy, in which he not only provided for the isolation of the infected people, but held the suspected for observation and cleansing. In the fourteenth century, certain restrictions were placed upon vessels arriving at Venice and Genoa, in Italy, to prevent the introduction of the plague, but it was not until the fifteenth century that quarantine was generally established.

The early system of quarantine was not based upon scientific facts or experience, but appears to have been an outgrowth of that peculiar period (noted for ignorance and superstition) known as the "dark ages." The name "quarantine" fairly indicates the hypothetical extravagance which held sway at its birth. As out of the *forty days'* fast in the wilderness grew *Lent*, the period of abstinence instituted for the purification of the soul, so the process of purifying ships and passengers from so called contagion was made to cover forty days, and this process was termed quarantine.¹ In the measures blindly enforced to protect seaports from infection, not only was commerce crippled, and property needlessly sacrificed, but the comforts and rights of the suspected were entirely ignored. They were not only compelled to undergo a tedious, and worse than useless, period of observation, but, by the very process of sequestration, they were exposed to tenfold greater danger from fomites that might chance to be in the ship. Many of the senseless and inhuman practices which grew up under the name of quarantine, have by degrees, and from time to time, been discontinued, and yet—so hard is it to cut loose from the influence of tradition—not a little of the fog and delusion associated with the term "quarantine" in the past continues to the present day, especially in the countries where quarantine was first established.

As the visits of the plague became less frequent and less severe, yellow fever and cholera commenced their migrations. These diseases gave a new interest to quarantine, which had previously been confined in its operations to the old world, but by these diseases was extended to the new. To the quarantine of ships, and of those who travelled by them, was added the "*cordon sanitaire*" against cholera, in the hope of preventing its march by land. This last measure has been enforced in Europe with the utmost rigor, and, though utterly futile in its results, appears

¹ Charles Caldwell, M.D., on Quarantine, 1837.

not to have been entirely abandoned in some localities even during the prevalence of the last recorded epidemic of this destroyer.¹

In America, quarantine was first established in 1758, at New York, against yellow fever. Though I shall have occasion, further on, to speak of the administration of quarantine at New York, it serves to mark the progress and application of experience in this direction to note here some of the changes which have taken place at that port. In 1811, we find that vessels arriving from infected districts were detained thirty days at quarantine, and passengers and crews twenty days after the occurrence of the last case of yellow fever. In 1830, healthy persons arriving in vessels from infected localities were permitted to proceed to the city, but without their baggage. Notwithstanding that many pernicious restrictions still stand upon the statute-books of the State, the enforcement of them is left to the medical officer, whose opinion is more and more recognized. It is now found practicable not to detain either healthy passengers or infected vessels. This arises from the generally accepted principle, that healthy individuals do not convey the morbid poison of cholera or of yellow fever, but that the poison finds lodgment in confined clothing, and especially in the vessels themselves, under favoring conditions. To detain an infected vessel has been found to increase the virulence of the poison. Accordingly, the ship's cargo is promptly transferred to lighters in the bay, freely exposed to light and air, and the vessel, after thorough disinfection, is allowed to proceed. In strong contrast with the foregoing, is the practice pursued at Pensacola, on the Gulf Coast. In May, 1874, upon the arrival of yellow fever at quarantine, the City Council of Pensacola passed an ordinance which is here given in full:—

"Saturday, May 30, 1874.—Board met, pursuant to call from Mayor. The object of the call having been stated, on motion it was resolved that all vessels arriving at this port from infected ports shall be compelled to remain in quarantine until frost; or said vessel shall be allowed to depart from this port at any time during quarantine, at the option of the commander or captain of said vessel; but in no case shall any such vessel be permitted to load, take in, or discharge, cargo, within the limits of the quarantine station during the existence of quarantine; nor shall any person being on board any such vessel be allowed to visit the city during quarantine.

"Resolved further, that the Mayor be requested, and he is hereby fully authorized and empowered, to employ a good and sufficient armed guard, with a good and sufficient boat, to patrol during the night on an established line between the quarantine station and this city; and that the Mayor be requested to instruct said guard to prevent all communication whatever, by boat or otherwise, between said station and this city, and to use sufficient force to attain that end, should it be necessary to fire into the person or persons attempting to violate said quarantine.

"Attest: M. P. DE RIOBOO, Clerk."

The results of these widely different methods may be stated in a few words: During each of the past five years, and more, a number of infected vessels arrived at the New York quarantine station. Many cases of yellow fever were treated in Quarantine Hospital, but in no instance did the disease spread to the city, or affect a single attendant on the sick. At Pensacola, in 1874, the infected ships were anchored near the quarantine

¹ Dr. Milroy, in an article in the British and Foreign Medico-Chirurgical Review, No. lxxxiii., states that "in 1867 military cordons were drawn around the infected districts in Montenegro, and persons who dared to cross them were shot. The horrors of famine were thus added to those of pestilence."

station. Communication from the infected vessels and from quarantine was had by night with the land ; and when, under the fostering conditions for propagation, the yellow-fever poison had gained sufficient virulence, the disease spread to the city and the naval station near by, the quarantine medical officer himself falling a victim to the system which he had blindly endeavored to carry out.

In passing to a brief notice of quarantine regulations at two other ports of the United States, it is proper to mention the fact that the control of quarantine in this country is not assumed by the general government, but that it is established and enforced by each seaboard State, or municipality, for itself. The only exception occurred during the war of the rebellion, when the commanding general of the Union armies, upon the recommendation of the Surgeon General of the Army, directed (1) that all vessels arriving from ports infected with cholera, but having had no case during their passage, should be quarantined for fifteen days and thoroughly fumigated, and (2) that all vessels having had cholera on board during their passage, should be quarantined for fifteen days after the termination of the last case, and thoroughly fumigated.

The quarantine regulations at the port of New Orleans, in 1822, authorized the health officer, in his discretion, to continue quarantine indefinitely, but provided that infected vessels should be detained not less than fifteen days after the recovery of the sick, and purification of the vessel. Healthy vessels from healthy ports were detained five days, and "vessels from any port of Europe, arriving between the first of May and the first of November, bringing more than twenty passengers, were not, however healthy, permitted to come within three leagues of the city, until after the first of November in any year."¹ A committee on quarantine for the State House of Representatives of Louisiana, reported that "during the last year [1822], notwithstanding the strictest compliance with these laws, our expectations were frustrated at the very moment when we thought we could indulge the hope of the most complete success." Under the present laws in force at the New Orleans quarantine, vessels hailing from ports infected with yellow fever are allowed to pass to the city after ten days from the date of leaving an infected locality, and in this period is included the time consumed in the passage. The Spanish bark Valparaiso, which introduced yellow fever into the United States in 1873, arrived at the quarantine station below the city of New Orleans on the 24th of June, eight days out from Havana. She completed the two remaining days of quarantine required by law, and having been twice fumigated with chlorine, and carbolic acid having been used in her pumps, she proceeded to the city, where the mate was attacked on board on the fourth of July, and died. Eight days subsequently, the mate of a steam-boat, laid up for repairs at the same wharf, was also attacked, and died. The first case of the cholera epidemic of 1873, in the United States, occurred at New Orleans in the month of February, when quarantine is not enforced. The man who first died of the disease had resided two months in New Orleans, and at the time of the attack was engaged in discharging cargo from a Liverpool vessel.

Under revised quarantine laws adopted in South Carolina in 1869, healthy vessels arriving at the port of Charleston, in that State, from infected ports, are detained from fifteen to twenty days, and thoroughly

¹ History of Quarantine in Louisiana, from 1821 to 1846. By B. Dowier, M.D., New York Journal of Medicine, 1846, p. 160.

cleansed. If no case of disease be developed, the vessel is allowed to proceed to the city. If, however, cases of disease have occurred on the passage, the vessel is subjected to a quarantine of thirty¹ days, or longer; all sick are promptly removed to the lazaretto, and the vessel is disinfected as before. Under the careful enforcement of these rules, no case of yellow fever has entered the city, notwithstanding that the disease has been brought to quarantine every summer, except in 1871. In the latter year, when no recognized case arrived by ships, the disease broke out in the city.

Turning from the diversity of opinion, practice, and results of quarantine, in this country, we observe a most rigid quarantine enforced by countries bordering on the Mediterranean, while England has, during late years, maintained the free *pratique* of her ports. Because England, from her climatic conditions, comparative isolation, and wise measures of internal sanitation, is able to maintain this advanced position, it does not follow that the seaports of the continent can with impunity conform to her example. In India, the endemic home of cholera, quarantine has proved unavailing, and thence, from the standpoint of some observers in that country, it is argued that measures to contravene the progress of cholera are useless. Were quarantine to be established in the West Indies against yellow fever, it would require no prophetic foresight to predict the result. The conventions of Paris, Constantinople, and Vienna have happily done much to harmonize the conflict of opinion which has prevailed in reference to the particular system which should be applied in quarantine. This system, however, must necessarily be modified by the geographical position and climate of the countries concerned.

To ascertain, as nearly as possible, what precautions are necessary, and what restrictions superfluous, in the administration of quarantine, the next step will be to consider the characteristics of cholera and of yellow-fever propagation, in order to determine as nearly as may be the prophylactic value of *Port Sanitation*, a term which most definitely expresses the practical measures indicated by experience.

Cholera.—Amongst the many views respecting cholera, it is generally admitted that the endemic home of the disease is India, especially the valley and delta of the Ganges, and that it is caused by a specific poison capable of reproduction or multiplication. Whether the endemic existence of cholera in India is due to peculiarities of air, temperature, soil, or water, or to the filth of uncleanly masses of people, is not determined; but it is undoubtedly true that each and all of these influence the propagation of the poison, and the spread of the disease outside of India. Some of the apparently well-established facts respecting cholera in India are: (1) That it only prevails epidemically at intervals, usually of several years; (2) that since its first migration around the world, it has not passed the border of its endemic home to prevail epidemically in other countries, except at times when the disease has shown unusual virulence and diffusion in India; (3) that the number of persons attacked in the same town or city, during different epidemics, varies considerably, even where the surrounding conditions are apparently equally favorable to the spread of the disease; (4) that it is possible to flee from it,² showing that a locality or place is the centre or focus of infection; (5) that

¹ Dr. Lebby, the Health Officer at Charleston, has recently informed me that, at the last session of the legislature of South Carolina, the period of quarantine was reduced to fifteen days.

² The mountains of Lebanon have always proved a safe retreat for the inhabitants of the cholera-stricken cities of Syria.

recent improvements in the sanitary condition of jails in India have rendered them almost exempt from visitation by cholera, many escaping entirely, and very few of those attacked suffering with severity;¹ and (6) that attendants upon the sick, in cholera hospitals removed from infected localities, do not suffer more than any other class, and usually enjoy entire immunity.

Dr. Cunningham maintains that the spread of cholera does not depend in any degree upon the use of drinking water polluted by cholera evacuations. Over against this statement is to be placed the fact that the mortality rate from cholera has greatly diminished in Calcutta,² since the introduction into that city of water less liable to contamination than formerly.³ The fact that those attacked by cholera, and those who escape, in any given locality, drink from the same wells or other source of water supply, is not proof positive that the cholera poison may not be conveyed through the medium of drinking water, while the condition of individual susceptibility remains as an undisputed factor in the development of the disease. Many undoubtedly receive the poison who do not suffer from it. Proof does not exist of cholera arising from impure water, uncontaminated with cholera dejections, but the cholera poison is unquestionably intensified in its action, or the susceptibility of individuals increased, or both, by the use of drinking water containing organic impurities. Experience outside of India⁴ abundantly proves that the cholera-principle is portable; that it is carried by ships, and in clothing and baggage, when excluded from the light and air. The spread of epidemic cholera is characterized by localization in particular places, ships, or houses, which then become centres of infection. The activity of these *foci* of infection, as well as the intensity or fatality of the disease, appear to depend upon certain causes associated with the aggregation of human beings, and the attendant evils of impure air, impure water, and filth. When these are present, a mild case of cholera serves to kindle an epidemic as readily as a spark from the hunter's flint may kindle a fire in the dry, rank grass of a Western prairie; and the progress, controlling influences, and results, of both sparks, are not dissimilar. Individuals, infected with the disease, who travel during the period of incubation, may, under favoring conditions, set up new *foci* of infection at the places where they are attacked. These "favoring conditions" are both individual and local, and, when either are absent, the cholera germ may slumber, or may lose its reproductive power altogether. The non-receptivity of certain localities, and of individuals, has long been recognized, and is undoubtedly due to good sanitary conditions.

There is strong reason for believing that cholera dejections, which appear to be harmless in their fresh state, become actively poisonous

¹ Report of the Cholera Epidemic of 1872, in Northern India; by J. M. Cunningham, M.D., Sanitary Commissioner with the Government in India.

² British and Foreign Medico-Chirurgical Review, July, 1872, p. 56.

³ Prof. von Pettenkofer states that whole towns in Germany, which were ravaged by cholera during former visitations, have been entirely free from the disease during late epidemics, and that this result has been brought about by thorough and efficient drainage, and by purification of the water supply.

⁴ Both Dr. Cunningham and Dr. Bryson maintain that cholera is not spread by traffic or human intercourse. The difficulties in the way of proving or disproving the portability of the cholera-principle in a country where the disease originates, are too apparent to give any weight to this negation. The causes or vehicles which spread a disease, not contagious in the sense in which smallpox and typhus are contagious, can only be determined, if determined at all, outside of the endemic home of the disease.

with the commencement of fermentation or decomposition. Acid disinfectants interrupt or prevent altogether the fermenting process, thereby destroying the poison. In like manner, the acid secretions of a healthy stomach are believed to neutralize or render innoxious a certain amount of the cholera-principle. The almost universal testimony is that good sanitary conditions lessen the influence of the attack, restrain its dissemination, and frequently ward off the disease entirely. Dr. Harris has remarked, in referring to cholera in New York, in 1866, "interpret it as we may, the events in the experience of that visitation of cholera demonstrated the practicability of dealing with the transportable and exotic, or germinal, factor of the pestilence as an enemy to be held in restraint, and its propagating attribute to be destroyed—a pestilence to be *stamped out* by definite hygienic measures."¹ There is abundant proof that the specific poison of the first cholera epidemic in the United States, and of succeeding epidemics, down to the last one, was introduced by ships from Europe, and the testimony of European observers furnishes conclusive evidence that the disease was imported into that country from India. The last epidemic of cholera in this country has differed from previous epidemics, in that direct connection between the initial cases and an imported germ has not been established,² but the fact remains that nearly two thousand emigrants from cholera-infected districts of Europe arrived in New Orleans during the month of the outbreak and that immediately preceding.³ It may be stated, as a general fact, that each period of epidemic prevalence of cholera in America has been associated with a similar period in Europe.

The morbific principle of cholera has from time to time shown a disposition to permanent lodgment by surviving the winter seasons of Europe⁴ and America. In the epidemic of 1854, in this country, the disease spread to the Pacific coast, and was several times re-imported from Central America to the port of New York; but the generative principle of each epidemic has finally died out, and each succeeding epidemic has depended upon fresh importations from India.⁵ Emigrants from infected districts have always been a prolific cause of intensifying and spreading the disease. "It is a matter of common experience to find that at times, when the disease is only of occasional or sporadic occurrence in Calcutta, emigrant ships leaving the port are scenes of severe outbreaks."⁶ The readiness with which a vessel takes on the characteristics of a crowded community or city, and becomes a centre of infection, will be more readily appreciated, and the measures to prevent the spread of cholera by ships more wisely directed and applied, when it is considered that a ship is but a town afloat. The ill-ventilated hold and

¹ Reports and Papers of the American Public-Health Association, vol. i. p. 346.

² There occurred, in 1873, three later outbreaks at widely remote points in the United States, which were due to poison imported in personal baggage packed in the infected districts of Sweden, Holland, and Russia. Surgeon Ely McClellan, U.S.A., in his Report on the Cholera Epidemic of 1873, in the United States.

³ Dr. McClellan, op. cit.

⁴ Drs. Pelikan and Arkhangelsky have shown that cholera was present in Eastern Europe from 1847 to 1856, and again from 1865 to 1873, though evincing a feeble activity during much of the time.

⁵ Prof. von Pettenkofer maintains that "it is a fact independent of all theory, which has been observed in every epidemic of cholera, in every place, and on every occasion, that the attacks in each individual house terminate on the average within twelve or fourteen days." Cholera, How to Prevent and Resist it. By Dr. Max von Pettenkofer. Translated by Dr. Hime, 1875.

⁶ Calcutta Review, 1869.

foul bilges are the counterpart of the filthy sewers and cesspools of a filthy city.

Yellow Fever.—Yellow fever is a disease produced by an invisible poison, capable of self-multiplication outside of the human organism. This something—the germ or miasm which has hitherto eluded microscopical demonstration—is a product of the tropics. It shows a disposition not to spread in high, salubrious lands, but exhibits a preference for low regions, especially the filthy portions of cities. Filth and high temperature are as truly its concomitants as cleanliness and cold are opposed to its lodgment or propagation. In this country, yellow fever has prevailed in most of the Atlantic and Gulf cities, and in many of the towns along the Mississippi River.¹ In some instances it has been carried inland with people fleeing from infected localities, but it has never shown a disposition to spread epidemically at points remote from the continuous water-roads of commerce. The cities of the great lakes have always been exempt from the disease.

In considering the morbific cause of the disease, we are necessarily restricted to an examination of its characteristics or comportment, exhibited in different places and under different conditions. We are, however, met at the outset with the difficulty and uncertainty of distinguishing between yellow fever and the pernicious malarial fevers of the Gulf coast. The cases that end fatally furnish reasonable certainty of the diagnosis given, but the milder cases that recover scarcely escape from doubt.

This uncertainty in determining the nature of mild cases, divides the profession on the question of the endemic lodgment of the disease on the Gulf coast, and serves to complicate the question of quarantine. Whether the disease was endemic in the intertropical islands of America, before it was brought from Africa, is uncertain; but there is no doubt now of its permanent lodgment in the West India Islands. The fact that the island of Key West, off the southern extremity of Florida, is in daily communication with Havana, makes it extremely difficult to determine the question of importation at that particular point. The weight of evidence, however, is against the assumption of an indigenous origin of the disease in the border lands of the Gulf, but it is probably true that the poison has there been preserved through the winter in fomites, though it is believed that the United States is not affected epidemically except by the imported germ. The gerin is transmissible. It is capable of being transported in the personal effects of passengers and sailors, but the damp, filthy holds and bilge water of ships are its favorite lurking places, where, if confined, it multiplies and increases in virulence to such an extent as not only to affect those on board, but even to exert its pernicious influence in the direction of the currents of air to a considerable distance. A vessel anchored at a wharf in Havana, or other infected place, appears to become, for the time being, a part of the infected region; and in sailing to a distant port, the ship transports the poison as surely as could be done by transplanting a section of the infected island of Cuba itself, were this possible.

Yellow fever is not communicated from the sick to the well, the sick being dangerous only as possible carriers of the poison-germ or miasm; hence all persons from an infected district may safely be considered as

¹ Greenville Dowell, M.D., of Galveston, states in his forthcoming work on the History of Yellow Fever Epidemics, etc., in the State of Texas, that "yellow fever has spread to 228 cities and towns, and in 28 States in the United States, appearing 741 times, and causing 65,311 deaths."

harmless when the period of incubation, which lasts from two to six days, has passed. This simplifies the question of quarantine, and indicates the direction of preventive measures to the vessel and cargo, or to the locality, if the poison have found lodgment on shore.

We have come now to the question of practice, and to the consideration of the methods which should be pursued to secure the greatest protection to the public health against cholera and yellow fever, with the least restriction upon commerce. We may differ on the questions of the nature and modes of propagation of cholera and yellow fever, but it is believed that all meet on the common ground of prophylactic measures, and will accept the proposition of *General Sanitation*—applied to the endemic abodes of cholera and yellow fever, to ships, and to exposed countries—as the surest means of stamping out these diseases. The general question of preventive measures, is one intimately associated with that of higher civilization. Every improvement in India, in matters of drainage, in securing pure drinking water, and in personal cleanliness of the people, will tend to lessen the ravages of cholera there, and to diminish the chances of its spread abroad. In the West Indies, the harbor of Havana is most frequented by commercial people, and is the most prolific source of yellow fever.

In a recent personal letter to myself, Dr. Peters has expressed the opinion in reference to Havana, which he had just visited, that “an international public sentiment should be created against the filthy and careless ways of the authorities, which cause so much suffering and death among the mercantile and public navies of the whole world. The harbor is small and landlocked; all the drainage and sewage of the city go into it, and very little gets out of it.” Dr. Peters suggests that a canal could be made at the head of the harbor, to the ocean, allowing the tide-water to sweep through the whole harbor, and thus remove its unhealthfulness. A vessel exposed to the influences of an infected harbor may not be able to escape, but the danger can be greatly lessened by enforcing strict cleanliness of the men and vessel. The bilge should be changed every day with sea-water, until the pumps bring clear water. The men should be compelled to bathe and change their flannels daily, when their work is done, and should not be allowed to sleep on the open deck, or in the lower part of the vessel. The same precautions should be continued through the voyage from a yellow-fever port. Ventilation should be freely encouraged, and no confined air allowed in any part of the vessel, if it be possible to prevent it. There is an example of a ship trading between New York and Havana, on which these precautions have been strictly enforced for a period of twelve years, and not a single case of yellow fever has occurred on board.¹ The proprietors of a line of steam-vessels, trading and carrying passengers between West India ports and New Orleans, employed an experienced person on each vessel, during last year, to supervise its sanitary condition and to disinfect it after the discharge of each cargo, with a similar result.²

I have already described the manner in which a ship becomes infected with cholera, and, as cleanliness is the great end to be attained, and maintained, on shipboard, the general preventive measures against this disease are not unlike those suggested against yellow fever. If, however, one or more persons are seized with cholera on board a vessel, they

¹ Communicated by Dr. Vanderpoel.

² Communicated by Dr. C. B. White.

should be separated from the well passengers and crew; their stools should be disinfected with a solution of sulphate of iron, and at once thrown into the sea; and all soiled clothing should be burned or thrown overboard. But if cases occur after the first four or five days out from port, it is safe to conclude that the vessel is the source of infection. Any suspected baggage should then be disinfected, and, for ten or twelve days, all water used on board should be boiled before being served out.¹ Experience teaches that a cholera-infected house, or ship, ceases to impart the disease after about twelve days, unless a new crop of the poison be introduced. An outbreak of cholera on shipboard can certainly be stamped out, and it is possible to do so during the passage of a steamship from Europe to America.

The foregoing suggestions can be carried out by any master who possesses sufficient intelligence to navigate a vessel, and it is believed that by imparting such definite information to seafaring men, commerce will be relieved from most of the restrictions reasonably imposed by quarantine. The *unreasonable* hindrances imposed by quarantine can only be corrected by cutting loose from senseless traditions and theories. It is unreasonable, as it is impracticable, to apply a theoretically uniform quarantine to all places, without reference to climate, the relations of surrounding countries, or the natural history of the disease to be combated. The question should be settled, separately and practically for each country or place, by taking into account the liability to infection of the port of destination, the period of incubation of the disease, the length of time consumed in the passage, and the measures enforced by the vessel *en route*. True quarantine measures should commence as soon as the vessel has left an infected port, and, if commercial people find that their well directed efforts are recognized by the port health-authorities, a strong incentive to rigid cleanliness will be thereby at once established, infectious diseases will be measurably restricted in their course, and the problem of quarantine will be made comparatively easy of solution. The practice of medical inspection and sanitation, as adopted and now carried out by Dr. Vanderpoel, at the port of New York, expresses the practical application of our present knowledge of cholera and yellow fever, as found applicable at that port.

If, upon arrival from an infected port, it be found that a vessel is clean, and that no case of sickness has occurred on board during her voyage, any detention of passengers and crew beyond the time required to thoroughly air and disinfect their baggage and dunnage, is believed to be unnecessary, provided that the period of incubation of the disease has passed during the voyage. If cases of *yellow fever* have occurred during the passage, the passengers and crew are removed from the vessel; the sick, if any, placed in hospital, and the well detained in a comfortable, healthy place, until five or six days after the occurrence of the last case, when they are allowed to proceed to the city. Meantime the vessel is at once subjected to a thorough airing and fumigation, and the cargo transferred to open lighters in the bay, by men kept for the purpose. During the unloading, the vessel is daily fumigated, and, when the transfer is completed, every available part is cleansed with water, and, after a thorough disinfection and fumigation, the vessel is returned to commerce. It is not found practicable to lay down arbitrary rules in regard to vessels on which *cholera* has occurred. Each vessel is judged by the particular features

¹ Plan recommended by Macnamara.

which belong to it. If prompt and energetic measures be enforced at the first appearance of the disease, its spread can be cut short, as before stated, and when this has occurred on vessels coming from Europe, it has been found practicable to allow the vessels, passengers, and crew to proceed to the city with only such delay as has been required to definitely ascertain the facts, and to perform disinfection. A vessel arriving, however, with cholera on board, the same precautionary measures are carried out as are enforced on the arrival of ships with yellow fever, and eight days after the occurrence of the last case, the passengers are allowed to leave. While the foregoing measures are necessary at New York, England wisely confines her supervision of cholera, from without, to the removal and care of the sick, and the cleansing of the vessel. It would be futile for England to quarantine against ports of the continent, with which she is in daily communication. Mr. Simon has truly said that "contraband of quarantine, like ordinary smuggling, is developed so soon as the inducements for it are considerable." Yellow fever is less liable to find lodgment in England than in Spain and Portugal, or in New York.

As it is the custom for many emigrants, bound for America from the continent of Europe, to embark at Liverpool or other healthy ports, when cholera prevails on the continent, this country is exposed to the introduction of the disease through the personal effects of such emigrants, sailing on healthy vessels from healthy ports. In a recent report to Congress, I called attention to the necessity for "prompt and authoritative information to threatened ports [of the United States] of the shipment of passengers or goods from a cholera-infected district," and suggested that the consular officers of the government should be instructed to place themselves in communication with the health-authorities of their respective localities, and to advise promptly, by cable, of the outbreak of cholera, and the sailing and destination of any vessels carrying passengers and goods from infected districts. By this plan (which the Honorable Secretary of State deems it practicable to carry into effect, if Congress provide the necessary means) the thorough disinfection of infected articles would be insured, and the danger from this source of infection would be lessened.

In considering the value and practice of disinfection, the fact should be kept in view that disinfectants are not as much needed as is cleanliness; where the latter prevails, the former are not required. It is when there is not time to get rid of filth, or when the poison has found lodgment, that disinfectants are applicable, and then their application should be thorough. The value of the several disinfectants is recognized, but their use on ships depends chiefly upon the manner of application. Ordinary fumigation cannot be relied upon to destroy the poison of an infected vessel, without removing the cargo, as has been exemplified in many instances, notably in the case of the bark Valparaiso, before cited. Dr. Perry¹ has devised an apparatus, which he used successfully at the New Orleans quarantine, in 1874, whereby either sulphurous-acid gas, carbolic-acid vapor, or heated air, can be forced into a ship through flexible rubber pipes, by means of blowers propelled by steam, all hatches and other openings in the ship having been first securely closed. Whether

¹ Effectual External Sanitary Regulations without Delay to Commerce. By A. W. Perry, M.D., of New Orleans. American Public-Health Association's Reports and Papers, vol. i. p. 437.

this process, in which are employed from thirty to one hundred pounds of sulphur, for a single vessel, will always prove effectual without removing the ship's cargo, remains to be determined by further trial.

It must be admitted that the germs of infectious diseases may elude the most vigilant sanitary supervision of shipping which can be devised; hence the importance of municipal co-operation, to the end that all exposed cities may, through wisely directed sanitary measures, be rendered less susceptible of infection. The value of sanitary supervision of ocean-travel and traffic, and of preventive measures at home, is more and more recognized by civilized nations, and the enlightened and vigorous prosecution of these means gives hope of rendering exposed countries less liable to infection; but the repeated battles against cholera and yellow fever should awaken an *international* spirit, and a determination to carry the war upon these diseases to their endemic homes, and to there instruct the people, and if need be compel them, to employ rational means of prevention.

From what has preceded, the following conclusions appear to be justified:—

I. The supervision of ocean-travel ought to be directed to securing good sanitary conditions for vessels at all times, out of as well as in port.

II. A system of Port-Sanitation should be adopted and administered for each country or place, separately, and should be modified in particular cases by taking into account the liability of the port to infection, the period of incubation of the disease, the length of time consumed in the voyage, and the measures enforced by the vessel *en route*.

III. In some countries, the detention of passengers and crews of ships hailing from infected ports is warranted, but for such time only as is necessary to complete the period of incubation of cholera or of yellow fever, counting from the date of departure from an infected port, or of landing from an infected vessel; in no instance should passengers or sailors be held for observation on board an infected vessel, and such vessel should not be detained beyond the period required for inspection, and for thorough disinfection and cleansing.

IV. Recognizing the fact that the morbific causes of infectious diseases may sometimes elude the most vigilant sanitary supervision of shipping, the importance of wisely directed internal sanitary measures can scarcely be overestimated.

V. As far as America is concerned, it is desirable that prompt and authoritative information should be had of the shipment of passengers or goods from districts infected with cholera or yellow fever, thereby insuring the thorough disinfection of infected articles.

VI. The endemic homes of cholera and yellow fever are the fields which give the greatest promise of satisfactory results to well-directed and energetic sanitary measures, and to this end an international sentiment should be awakened, so strong as to compel the careless and offending people to employ rational means of prevention.

NOTE.—The Conclusions appended to this paper were subsequently adopted and reported to the Congress as expressing the opinion of the Section on the subject.

